

## Symposium features cutting-edge stem cell research

By Ernie Hood

NIEHS and its neighboring research universities are hotbeds of scientific activity when it comes to the vast potential of stem cells, so it was only natural the Institute would hold a symposium on the topic. On April 11-12, NIEHS hosted [Unlocking the Promise of Stem Cells](http://tools.niehs.nih.gov/conference/dert_stem_2013/), ([http://tools.niehs.nih.gov/conference/dert\\_stem\\_2013/](http://tools.niehs.nih.gov/conference/dert_stem_2013/)) a meeting that brought together some of the nation's leading researchers in the field.

[Raja Jothi, Ph.D.](#), and [Guang Hu, Ph.D.](#), tenure-track investigators in the NIEHS Laboratory of Molecular Carcinogenesis (LMC), explore the biological mechanisms of stem cells and co-organized the gathering. They both believed having a discussion on how stem cells could be used to study environmental health science was needed, given the recent stem cell breakthroughs in regenerative medicine, drug discovery, and toxicity testing.

"We thought this would be a good opportunity to invite researchers, who are leaders in the field, to examine the current state of stem cell research and to think about how to move the discipline forward," Hu said. "The possibilities are endless, from scientific research tools to therapeutic applications."

The two days of presentations displayed a wide range of areas in which stem cells are poised to make major contributions (see [text box](#)). As NIEHS Scientific Director Darryl Zeldin, M.D., noted in his welcoming remarks, "Here at NIEHS, we're just beginning to appreciate how stem cells and their differentiated progenies can be used as new tools and as models for toxicologic studies, with the primary goal of understanding how environmental factors influence human health and disease."

### Gathering of like minds

The symposium attracted more than 250 attendees on both days. Participants came from local government agencies, universities, and industries, as well as from universities in Virginia and the National Institutes of Health (NIH) in Bethesda, Md.

"The meeting provided a great opportunity for local stem cell researchers to interact and network, which we hope will lead to many collaborative efforts in the future," Jothi said.

The conference kicked off with a keynote address on the role of chromatin regulation in stem cells by [Gerald Crabtree, M.D.](http://med.stanford.edu/profiles/Gerald_Crabtree/), ([http://med.stanford.edu/profiles/Gerald\\_Crabtree/](http://med.stanford.edu/profiles/Gerald_Crabtree/)) a Howard Hughes Medical Institute (HHMI) investigator and professor of pathology and developmental biology at Stanford University. The symposium was then divided into four sessions, each addressing a specific topic — adult stem cells, epigenetic regulation of stem cells, embryonic and pluripotent stem cells, and cellular differentiation and reprogramming.

NIEHS was well represented in the meeting. Both Jothi and Hu presented their work, as well as LMC head [Trevor Archer, Ph.D.](#), and George Fromm, Ph.D., a postdoctoral fellow in the Transcriptional Responses to the Environment Group headed by [Karen Adelman, Ph.D.](#)

Most of the conference's presentations dealt with highly specialized, basic research on the mechanisms underlying stem cell differentiation and self-renewal, but during the last session, speakers described new methods of using stem cells to model diseases, aid in drug discovery and screening, and advance regenerative medicine. As these approaches progress, researchers will indeed unlock the promise of stem cells, with exciting developments on the horizon.

(Ernie Hood is a contract writer with the NIEHS Office of Communications and Public Liaison.)



*Hu leads the Stem Cell Biology Group at NIEHS. (Photo courtesy of Steve McCaw)*



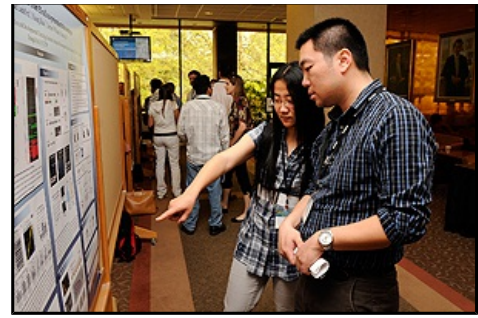
*Jothi heads the Systems Biology Group at NIEHS. (Photo courtesy of Steve McCaw)*



*With so much scientific interest in stem cells these days, the symposium was very well attended. (Photo courtesy of Steve McCaw)*



*Keynote speaker Crabtree presented exciting new concepts and methods in chromatin regulation. (Photo courtesy of Steve McCaw)*



*Symposium attendees were also given the opportunity to review more than two dozen posters that were on display in the Building 101 lobby. Xiaofeng Zheng, Ph.D., right, a visiting fellow in Hu's group, discussed his research findings with an attendee. (Photo courtesy of Steve McCaw)*



*Archer's presentation focused on chromatin remodeling proteins and stem cell function in transcription. (Photo courtesy of Steve McCaw)*



*Describing work emerging from the Adelman group, Fromm noted, "There's been a lot of interest in pausing over the last few years, especially in the fields of developmental biology and stem cell biology." (Photo courtesy of Steve McCaw)*

### Spotlight on stem cells

Crabtree delivered the keynote lecture on the role of BAF chromatin remodeling complex in stem cells and during development. He also described a chromatin *in vivo* system for quantitative modeling of chromatin remodeling kinetics in living cells.

**Iannis Aifantis, Ph.D.**, (<http://pathology.med.nyu.edu/people/faculty/aifantis-iannis>) an HHMI investigator and professor of pathology at New York University, spoke about the role of the Notch signaling pathway in hematopoietic cell development and leukemia, and the potential therapeutic use of Notch receptor agonists in the treatment of myeloid leukemia.

**Carla Kim, Ph.D.**, (<http://stemcell.childrenshospital.org/about-us/stem-cell-program-labs/the-kim-lab/>) from Boston Children's Hospital and Harvard Medical School, discussed the identification and characterization of the bronchioalveolar stem cells in normal lung and lung cancer, as well as the development of an *in vitro* system for the culture and functional study of those cells.

**Brigid Hogan, Ph.D.**, (<http://www.cellbio.duke.edu/faculty/research/hogan.html>) from Duke University, described the identification and characterization of airway basal stem cells that are essential for development, maintenance, repair, and disease of the lung.

**Terry Magnuson, Ph.D.**, (<http://genetics.unc.edu/faculty/magnuson>) from the University of North Carolina at Chapel Hill, spoke about epigenetic regulation of male germ cell development, with an emphasis on the polycomb repressive complex 2, a protein complex involved in the long-term epigenetic silencing of chromatin.

**Yi Zhang, Ph.D.**, ([http://www.idi.harvard.edu/investigators\\_research/investigator/yi\\_zhang/](http://www.idi.harvard.edu/investigators_research/investigator/yi_zhang/)) an HHMI investigator at Boston Children's Hospital and Harvard Medical School, described the role of Tet1 in DNA demethylation, and showed that Tet1 controls meiosis by regulating meiotic gene expression.

Archer presented detailed structure-function analysis of the Brg1 protein in transcriptional regulation.

**Minoru Ko, Ph.D.**, ([http://www.med.keio.ac.jp/rdb/gcoe-stemcell\\_en/view.php?i=78](http://www.med.keio.ac.jp/rdb/gcoe-stemcell_en/view.php?i=78)) of Keio University in Japan, discussed his group's work on the unique role of Zscan4 in the maintenance of genome stability and developmental potential by regulation of telomere elongation.

Hu spoke about the identification of Fip1 as a novel regulator of embryonic stem cell (ESC) self-renewal and its role in the regulation of polyadenylation in ESCs.

Jothi presented his group's findings on the role of nucleolin in the regulation of cellular homeostasis in ESCs, and in maintaining the balance between self-renewal and differentiation.

Fromm discussed the role of RNA polymerase II pausing in ESCs and during development.

**Konrad Hochedlinger, Ph.D.**, (<http://www.hsci.harvard.edu/people/konrad-hochedlinger-phd>) an HHMI investigator at Massachusetts General Hospital and Harvard University, presented a molecular roadmap of reprogramming somatic cells into induced pluripotent stem cells (iPSCs), with an emphasis on epigenetic changes.

**Ignacio Sancho-Martinez, Ph.D.**, (<http://www.salk.edu/labs/belmonte/people.php>) from the Salk Institute, described the lab's work on generation of cardiomyocytes from human ESCs for potential treatment of cardiac diseases and injuries.

**Lorenz Studer, M.D.**, (<http://www.mskcc.org/research/lab/lorenz-studer>) from the Sloan-Kettering Institute, spoke about the development of *in vitro* systems to derive neuronal cells from human ESCs or iPSCs for drug screening and potential cell therapies.

**Mahendra Rao, M.D., Ph.D.**, ([http://www.niams.nih.gov/Research/Ongoing\\_Research/Branch\\_Lab/Laboratory\\_Stem\\_Cell\\_Biology/](http://www.niams.nih.gov/Research/Ongoing_Research/Branch_Lab/Laboratory_Stem_Cell_Biology/)) from the National Institute of Arthritis and Musculoskeletal and Skin Diseases, part of NIH, described current development and available platforms for using ESCs or iPSCs for regenerative medicine and disease investigation at the NIH Center for Regenerative Medicine.

---

The Environmental Factor is produced monthly by the [National Institute of Environmental Health Sciences \(NIEHS\)](http://www.niehs.nih.gov/) (<http://www.niehs.nih.gov/>), Office of Communications and Public Liaison. The content is not copyrighted, and it can be reprinted without permission. If you use parts of Environmental Factor in your publication, we ask that you provide us with a copy for our records. We welcome your [comments and suggestions](#). ([bruskec@niehs.nih.gov](mailto:bruskec@niehs.nih.gov))

This page URL: <http://www.niehs.nih.gov/news/newsletter/2013/5/science-stemcells/index.htm>  
NIEHS website: <http://www.niehs.nih.gov/>  
Email the Web Manager at [webmanager@niehs.nih.gov](mailto:webmanager@niehs.nih.gov)